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| 09/800,987 | 03/07/2001 | Lawrence A. Kennedy | 27611/34370B | 6848 |
| 4743 | 7590 | 03/09/2005 | EXAMINER | |
| MARSHALL, GERSTEIN & BORUN LLP | | | RIDLEY, BASIA ANNA | |
| 6300 SEARS TOWER | | | ART UNIT | |
| 233 S. WACKER DRIVE | | | PAPER NUMBER | |
| CHICAGO, IL 60606 | | | 1764 | |

DATE MAILED: 03/09/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/800,987

Applicant(s)

KENNEDY ET AL.

Examiner

Basia Ridley

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 August 2004 and 02 December 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 December 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 030701.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

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DETAILED ACTION

Information Disclosure Statement

1. Based on applicant's comments in Amendment filed on 12 August 2004, the following document, submitted as part of the information disclosure statement filed on 7 March 2001, is now being considered by the examiner as to the merits, as indicated by included copy of PTO-1449 originally filed on 7 March 2001.

- "Kennedy et al. 10th Intern. Symp. on Transport Phenomena, Kyoto, Japan, Nov.30-Dec.3, 1997, 451-55".

2. The remaining documents cited in the information disclosure statement filed on 7 March 2001 have been already considered, as indicated by copy of PTO-1449 originally filed on 7 March 2001, which was included with the Office action mailed on 14 April 2004.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1-16 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Specifically, amended claim 1 recites the step of "heating the reactant mixture in the heated reaction zone from a temperature less than the superadiabatic combustion temperature to a temperature sufficient to result in a superadiabatic combustion". Applicant is relying on specification (P8/L21-25) for support. Said paragraph of specification does not provide support for the above claim

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language. Said paragraph recites “(...) flowing the reactant mixture through a heated zone (e.g. porous fixed-bed) of a reactor at a speed $u(t)$). The porous, fixed-bed (or solid phase) serves as an intermediate for heat accumulation and regeneration. The reactor operates at a temperature sufficient to result in a SAC of the reactant mixture.”. While this disclosure provides support for step of maintaining and regenerating heat of the reaction zone to allow for operation at temperatures sufficient to result in a SAC of the reactant mixture it does not provide support for the step of heating the reactant mixture in the heated reaction zone from a temperature less than the superadiabatic combustion temperature to a temperature sufficient to result in a superadiabatic combustion. Further, applicant’s attention is directed to page 14 of the instant disclosure where the specific operation of the reactor is described. Lines 3-22 describe the reactor as comprising three distinctive zones 32, 16 and 34. In the first half of the operation cycle the heat released in the reaction zone 16 is accumulated in the zone 34 as products of reaction travel through said zone 34 towards reactor exit. In the second half of the operation cycle the flow of reactants and products is reversed and the incoming reactants are preheated using heat accumulated in the zone 34, then said preheated reactants are reacted in the reaction zone 16 and produced reaction products leave the reactor through zone 32 releasing their heat which is accumulated in zone 32. Another embodiment clearly defining separate zones for reactant preheating and for actual reaction is described on page 16, lines 8-13. In this embodiment before the reactants enter reaction zone 16 they are preheated in tube 104 by reaction products leaving the reactor through annular space between the vessel 102 and tube 104.

Claim Rejections - 35 USC § 102

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

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6. Claim(s) 1-13 and 17-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Hasche (USP 2,844,452).

Regarding claim 1, Hasche'452 discloses a method of continuously generating combustion products from a fuel-rich reactant mixture, the method comprising:

- flowing the reactant mixture through a heated zone of a reactor, the reactor containing a porous fixed bed and operating at a temperature sufficient to result in a super-adiabatic combustion of the reactant mixture (Fig. 1 and C6/L74-C8/L55);
- heating the reactant mixture in the heated reaction zone from a temperature less than the superadiabatic combustion temperature to a temperature sufficient to result in a superadiabatic combustion (Fig. 1 and C6/L74-C8/L55) ; and
- combusting the reactant mixture in the heated zone to generate the combustion products and heat, the heat being sufficient to maintain the operating temperature of the heated zone for the super-adiabatic combustion of additional reactant mixture (Fig. 1 and C6/L74-C8/L55).

Regarding claims 2-13 and 17-18, Hasche'452 discloses all of the claim limitations as set forth above, additionally the reference discloses the method wherein:

- the reactant mixture comprises oxygen and one or more C₁ to C₅ hydrocarbons (C6/L74-C7/L1));
- the combustion products comprise hydrogen, carbon dioxide, and one or more C₁ to C₅ hydrocarbons (C8/L45-55);
- the C₁ to C₅ hydrocarbon comprises ethylene, propylene, butylenes, acetylene or mixtures thereof (C8/L45-55);
- the operating temperature of the heated zone is about 800°C to about 2500°C (C7/L16-22);
- the operating temperature of the heated zone is about 1000°C to about 1700°C (C7/L16-22);

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- the reactant mixture has an equivalence ratio of hydrocarbon to oxygen of greater than about 1.2 to about 20 (C3/L40-55);
- the equivalence ratio is about 2.5 to about 15 (C3/L40-55);
- the equivalence ratio is about 3 to about 10 (C3/L40-55);
- the reactor is operated at an internal pressure of about 0.1 atmosphere to about 100 atmospheres (C2/L63-C3/L20 and C4/L33-55);
- the reactor is operated at an internal pressure of about 1 atmosphere to about 100 atmospheres (C2/L63-C3/L20 and C4/L33-55);
- the fixed bed has porosity sufficient to allow gas flow therethrough (C6/L5-33);
- the fixed bed has porosity of about 10% to about 90% (C6/L5-33);
- the heat is a transient thermal wave (C6/L74-C8/L55); and
- the thermal wave is coupled to the flow of the reactant mixture (C6/L74-C8/L55).

Claim Rejections - 35 USC § 103

7. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
8. Claim(s) 14 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hasche (USP 2,844,452), as applied to claims 1 and 12 above, in view of Hasche (USP 2,845,335).

Regarding claim 14, Hasche'452 discloses all of the claim limitations as set forth above, but the reference does not explicitly disclose the fixed bed comprises pellets made from a material selected from the group consisting of alumina, silicon carbide, silicon nitride and quartz.

Hasche'335 teaches a similar process for production of combustion products wherein the operation conditions and product composition and yields are affected by addition of catalytic pellets to the fixed bed (C6/L36-C7/L75). Some advantages of using catalyst are to improve reaction

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efficiency and to lower the required reaction temperature.

It would have been obvious to one having ordinary skill in the art at the time of the invention to add catalytic pellets made from a material selected from the group consisting of alumina, silicon carbide, silicon nitride and quartz to the fixed bed of Hasche'452, as taught by Hasche'335, for the purpose of improving reaction efficiency and lowering the required reaction temperature.

Regarding claim 16, Hasche'452 in view of Hasche'335 disclose all of the claim limitations as set forth above, but the references do not explicitly disclose the fixed bed having any specific catalytic content. The content of catalyst in reaction zone relative to the porous material is not considered to confer patentability to the claims. As the operating conditions, for example reaction temperature and conversion efficiency, are variables that can be modified, among others, by adjusting the weight percent of catalyst in the reaction zone, the actual weight percent of catalyst in the heated zone would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the claimed weight percentages cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the weight percentage of catalyst in the fixed bed to obtain the desired reaction temperatures and conversion efficiencies (*In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980)), since it has been held that where the general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. (*In re Aller*, 105 USPQ 223).

9. Claim(s) 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hasche (USP 2,844,452) in view of Hasche (USP 2,845,335), as applied to claim 14 above, and further in view of Brophy et al. (USP 4,767,569).

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Regarding claim 15, Hasche'452 in view of Hasche'335 disclose all of the claim limitations as set forth above. Additionally the Hasche'335 discloses the method wherein the pellets in fixed bed are conventional (C7/L3-50), but the references do not disclose any specific dimensions for said pellets.

Brophy et al. teaches a method using refractory pellets which are active for partial combustion of hydrocarbons at conditions similar to the ones disclosed in Hasche'452 and Hasche'335 to produce similar products (C2/L11-50) wherein the pellets have a diameter of about 0.05 mm to about 10 mm (C2/L26-32).

As instant specification is silent to unexpected results, it would have been obvious to one of ordinary skill in the art at the time of the invention to use the refractory pellets of Brophy et al. having a diameter of about 0.05 mm to about 10 mm in the heated reaction zone of Hasche'452 in view of Hasche'335, since doing so would amount to nothing more than a use of a known component for its intended use in a known environment to accomplish entirely expected result.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

Response to Arguments

11. Applicant's arguments filed 12 August 2004 have been considered but are moot in view of the new ground(s) of rejection.

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Conclusion

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Basia Ridley, whose telephone number is (571) 272-1453.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola, can be reached on (571) 272-1444.

The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Technical Center 1700 General Information Telephone No. is (571) 272-1700. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Questions on access to the Private PAIR system should be directed to the Electronic Business Center (EBC) at (866) 217-9197 (toll-free).


Basia Ridley
Examiner
Art Unit 1764

BR
March 6, 2005